

كلية المستقبل الجامعة قسم هندسة الطب الحيوي

المرحلة الثانية



**HEAD & NECK**

# **ANATOMY**

(L8)

**SKULL BONES**

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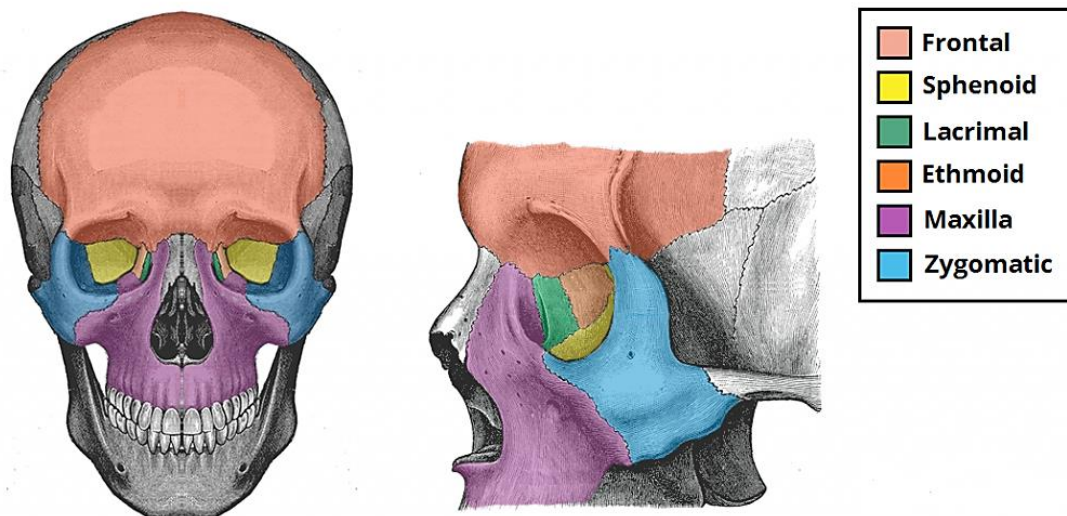
## The bony orbits

(or eye sockets) are bilateral and symmetrical **cavities** in the head. They enclose the eyeball and its associated structures.

### Borders and Anatomical Relations

The orbit can be thought of as a **pyramidal** structure, with the apex pointing posteriorly and the base situated anteriorly. The boundaries of the orbit are formed by seven bones.

It is also important to consider the anatomical relations of the orbital cavity – this is clinically relevant in the spread of infection, and in cases of trauma.



### Contents

The bony orbit contains the **eyeballs** and their associated structures:

**Extra-ocular muscles** – These muscles are separate from the eye. They are responsible for the movement of the eyeball and superior eyelid.

**Eyelids** – These cover the orbits anteriorly.

**Nerves:** Several cranial nerves supply the eye and its structures; [optic](#), [oculomotor](#), [trochlear](#), [trigeminal](#) and [abducens](#) nerves

**Blood vessels:** The eye receives blood primarily from the ophthalmic artery. Venous drainage is via the superior and inferior ophthalmic veins.

Any space within the orbit that is not occupied is filled with **orbital fat**. This tissue cushions the eye, and stabilises the [extraocular muscles](#).

### **Pathways into the Orbit**

There are three main pathways by which structures can enter and leave the orbit:

**Optic canal** – transmits the [optic nerve](#) and ophthalmic artery.

**Superior orbital fissure** – transmits the lacrimal, frontal, [trochlear](#) (CN IV), [oculomotor](#) (CN III), nasociliary and abducens (CN VI) nerves. It also carries the superior ophthalmic vein.

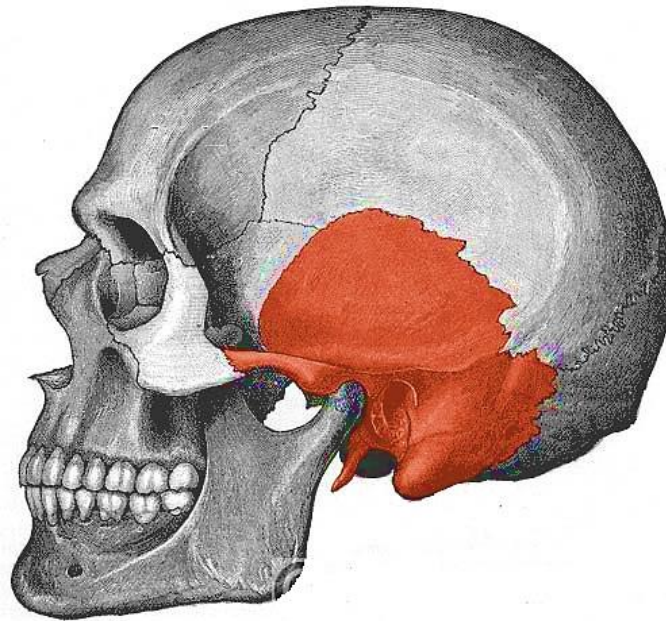
**Inferior orbital fissure** – transmits the zygomatic branch of the maxillary nerve, the inferior ophthalmic vein, and sympathetic nerves.

There are other minor openings into the orbital cavity. The **nasolacrimal canal**, which drains tears from the eye to the nasal cavity, is located on the medial wall of the orbit. Other small openings include the **supraorbital foramen** and **infraorbital canal** – they carry small neurovascular structures.

### **The temporal bone**

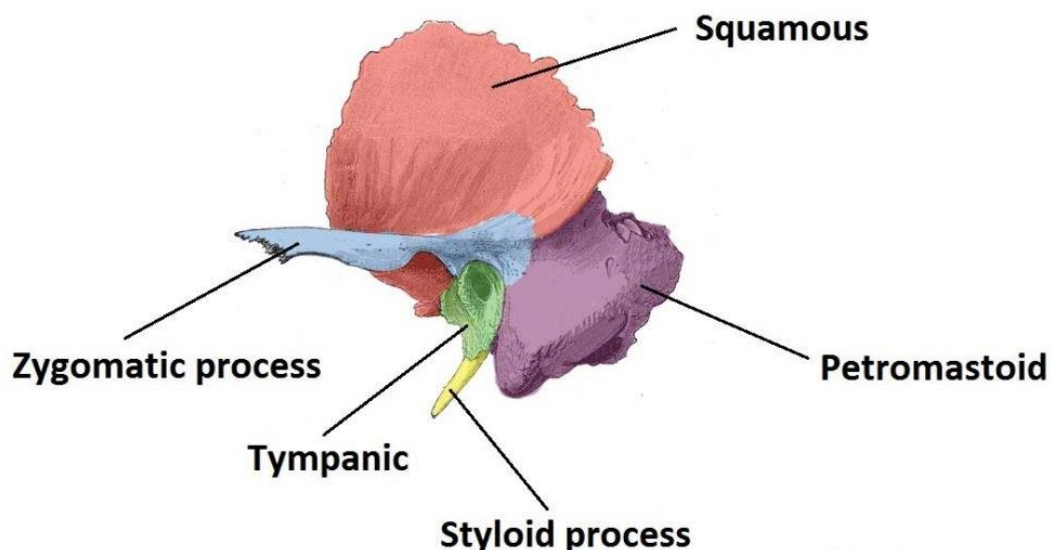
contributes to the lower **lateral** walls of the skull. It contains the [middle](#) and [inner](#) portions of the ear, and is crossed by the majority

of the **cranial nerves**. The lower portion of the bone articulates with the **mandible**, forming the **temporomandibular joint** of the jaw.



**Lateral view of the skull. The temporal bone has been highlighted**

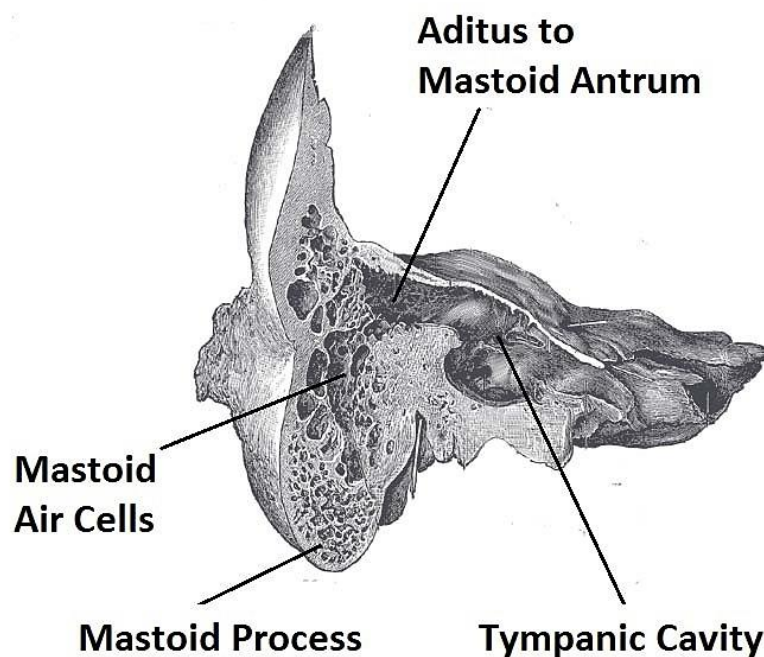
The temporal bone itself is comprised of five constituent parts. The squamous, tympanic and petromastoid parts make up the majority of the bone, with the zygomatic and styloid processes projecting outwards.



There are two items of note on the mastoid. The first is the **mastoid process**, an inferior projection of bone, palpable just behind the ear. It is a site of attachment for many muscles, such as the **sternocleidomastoid**.

Also of clinical importance are the **mastoid air cells**. These are **hollowed** out areas within the temporal bone. They act as a **reservoir** of air, equalising the pressure within the [middle ear](#) in the case of **auditory tube** dysfunction. The mastoid air cells can also become infected, known as **mastoiditis**.

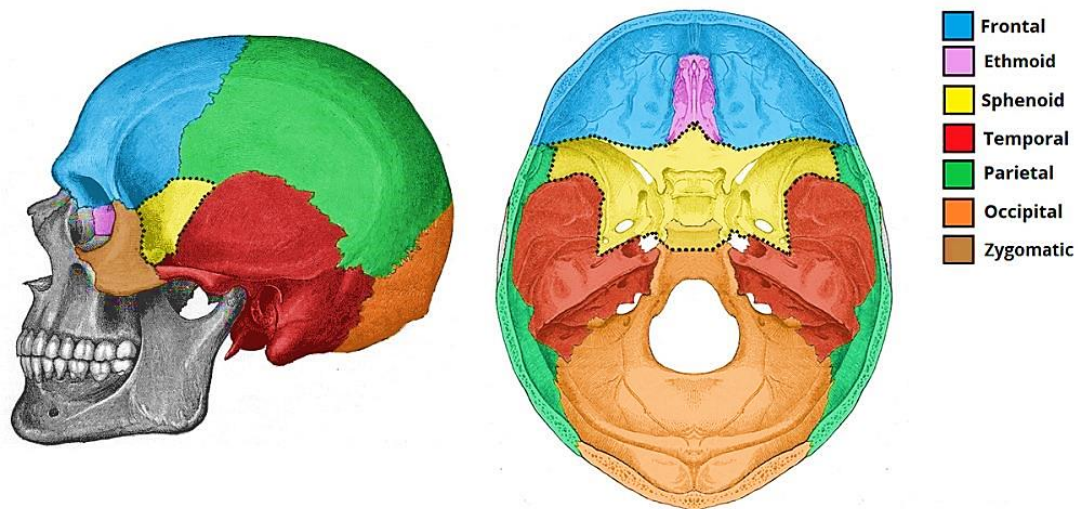
The **petrous** part is pyramidal shaped, and lies at the base of temporal bone. It contains the inner ear.



Coronal section of temporal bone, showing the mastoid air cells in more detail

## The sphenoid

The **sphenoid bone** is one of the eight bones that make up the cranium – the superior aspect of the skull that encloses and protects the brain. Its name is derived from the Greek '*sphenooides*', to mean wedge-shaped. It is an unpaired bone. It sits anteriorly in the cranium, and contributes to the [middle cranial fossa](#), the lateral wall of the skull, and the floor and sides of both orbits. It is '**butterfly-shaped**'. It consists of a body, paired greater wings and lesser wings, and two pterygoid processes.



**The position of the sphenoid bone (yellow) within the facial skeleton.**

The body lies at the centre of the sphenoid bone, and is almost completely cubical in shape. It contains the **sphenoidal sinuses**, which are separated by a septum – meaning that the sphenoid body is essentially hollow. The body articulates with the ethmoid bone anteriorly, and it is here that the sinuses open up into the nasal cavity.

The superior surface of the sphenoid body contains some important bony landmarks:

**Sella turcica** – a saddle-shaped depression. It has three parts:

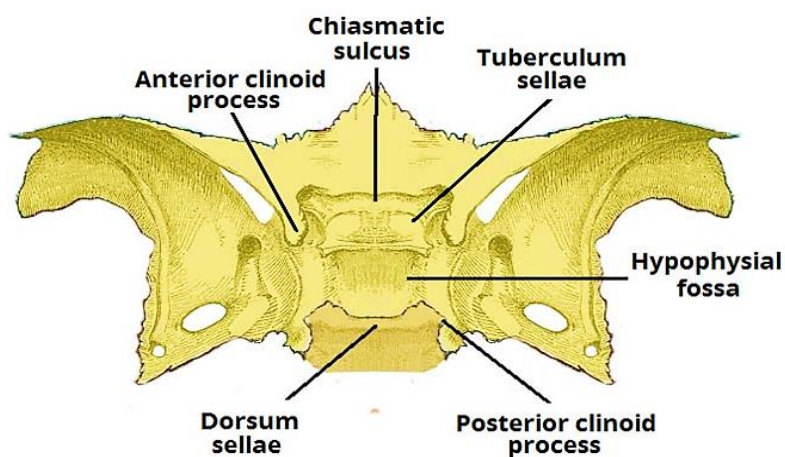
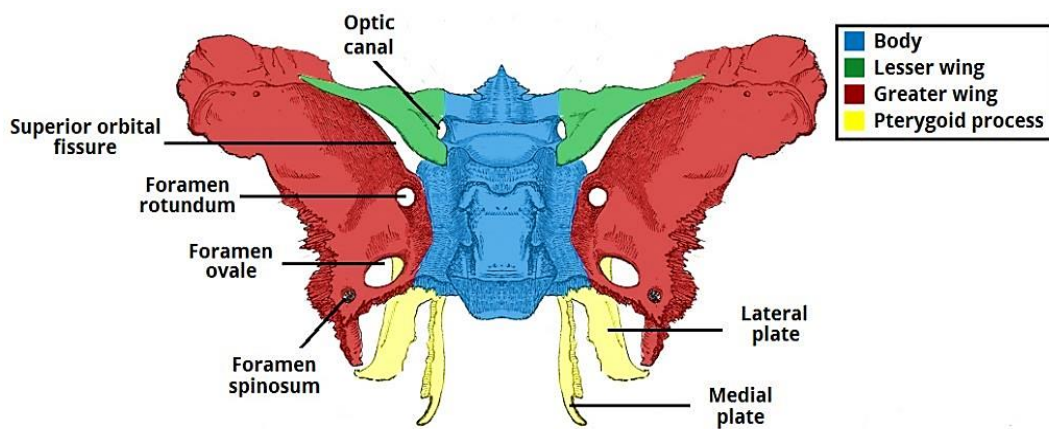
- *Tuberculum sellae* – forms the anterior wall of the sella turcica, and the posterior aspect of the chiasmatic groove.
- *Hypophyseal fossa* – the deepest part of the sella turcica, where the pituitary gland is located.
- *Dorsum sellae* – forms the posterior wall of the sella turcica.

**Chiasmatic groove** – a sulcus formed by the optic chiasm (where the optic nerves partially cross).



There are three **foramina** present in the greater wing – the foramen rotundum, foramen ovale and foramen spinosum. They conduct the maxillary nerve, mandibular nerve and middle meningeal vessels respectively.

The **lesser wing** arises from the anterior aspect of the sphenoid body in a superolateral direction. It separates the anterior cranial fossa from the middle cranial fossa. It also forms the lateral border of the **optic canal** – through which the optic nerve and ophthalmic artery travel to reach the eye. The medial border of the optic canal is formed by the body of the sphenoid. There is a ‘slit-like’ gap between the lesser and greater wings of the sphenoid – the **superior orbital fissure**. Numerous structures pass through here to reach the bony orbit.

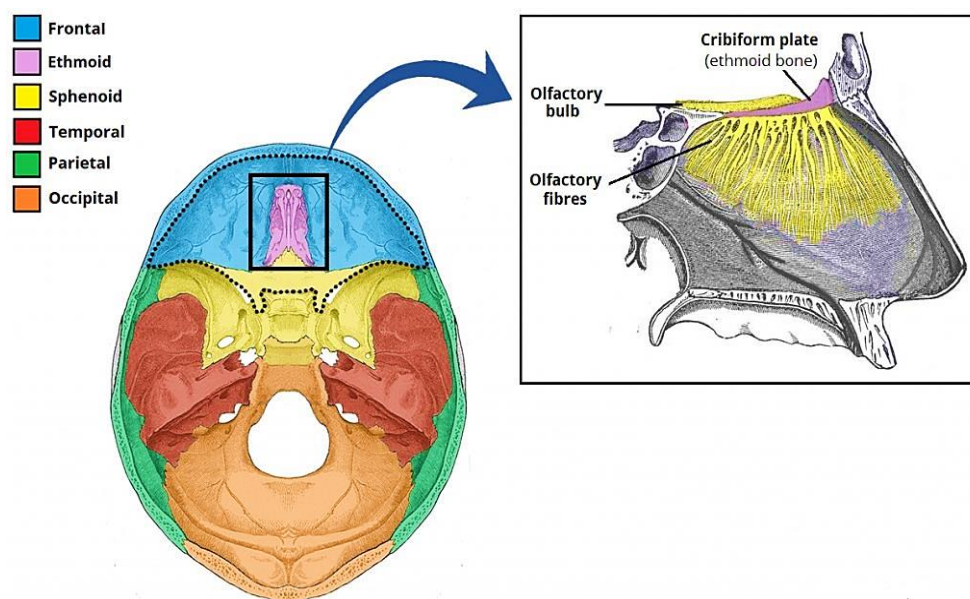


## The ethmoid bone

is a small unpaired bone, located in the midline of the anterior cranium.

The term 'ethmoid' originates from the Greek '*ethmos*', meaning sieve. This is reflected in its lightweight, **spongy** structure. The ethmoid bone is one of the 8 bones of the cranium. It is situated at the roof of the [nasal cavity](#), and between the two orbital cavities. It contributes to the medial wall of the [orbit](#) and forms part of the [anterior cranial fossa](#), where it separates the [nasal cavity](#) (inferiorly) from the cranial cavity (superiorly).

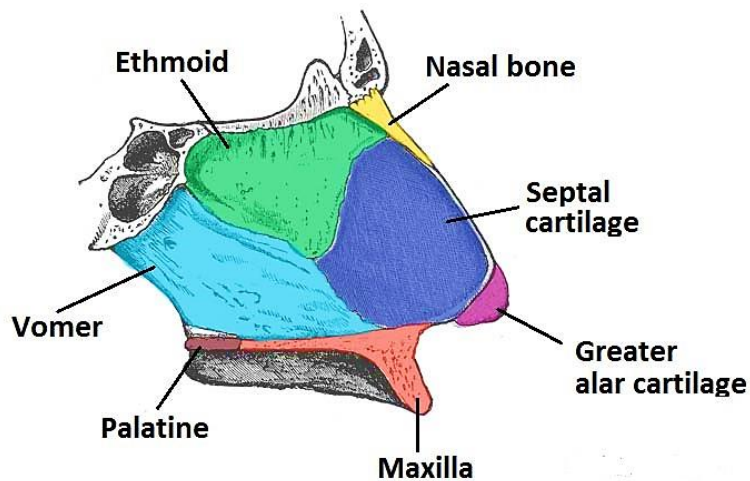
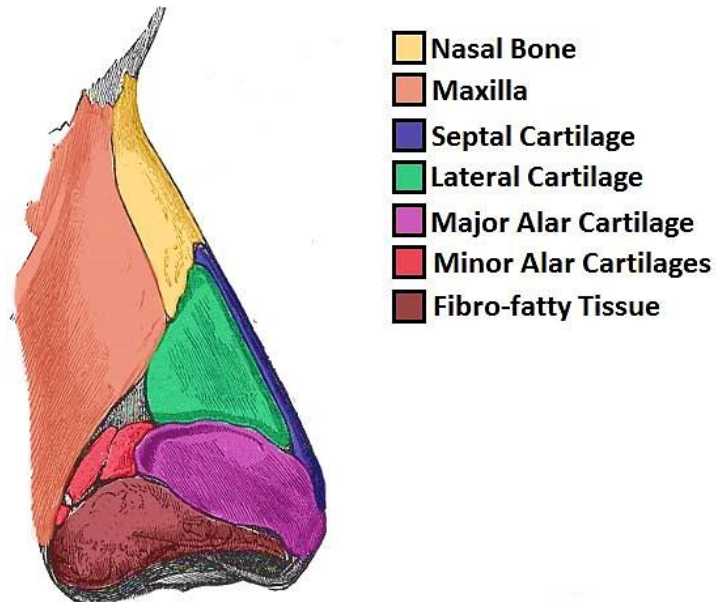
It also forms a significant portion of the nasal septum and lateral nasal wall. The [olfactory nerve](#) (CN I) has a close anatomical relationship with the ethmoid bone. Its numerous nerve fibres pass through the cribriform plate of the ethmoid bone to innervate the [nasal cavity](#) with the sense of smell. The ethmoid bone is made up of three parts – the cribriform plate, the perpendicular plate, and the ethmoidal labyrinth. The ethmoid bone contains two **ethmoidal labyrinths**. These are large masses located at either side of the perpendicular plate, which contain the [ethmoidal air cells \(sinuses\)](#).





## The nasal skeleton

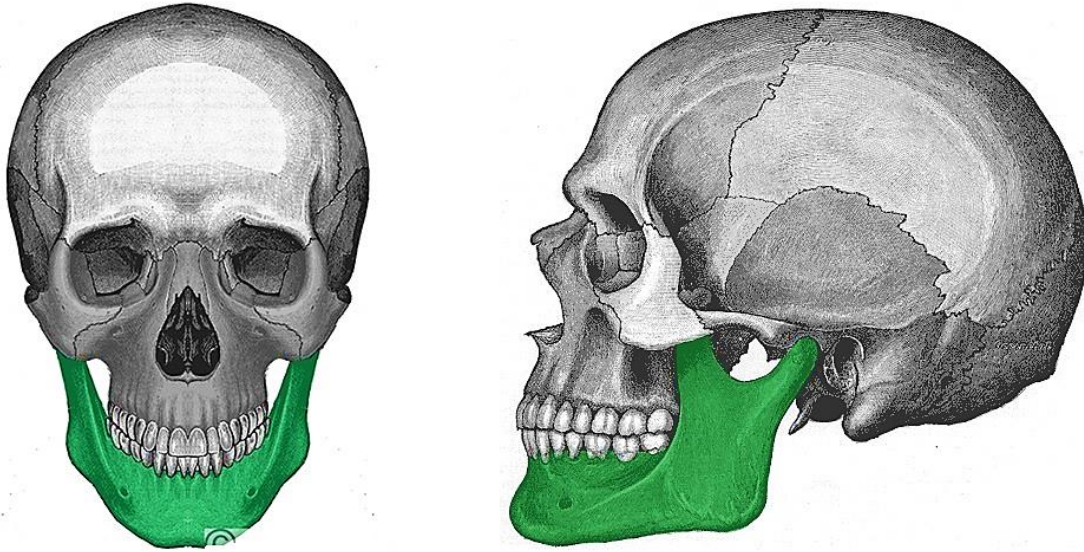
is a combination of bone and cartilage which forms both what we can see as the external nose and the internal nasal septum – which divides the two nasal cavities of the head. The skeleton of the nose is formed by three types of tissue; bone, cartilage and fibro-fatty tissue.



## The mandible

located inferiorly in the facial skeleton, is the largest and strongest bone of the face. It forms the lower jaw and acts as a receptacle for the lower

teeth. It also articulates on either side with the temporal bone, forming the **temporomandibular joint**.



**Anterior and lateral views of the mandible within the facial skeleton**

The mandible consists of a horizontal body (anteriorly) and two vertical rami (posteriorly). The body and the rami meet on each side at the angle of the mandible. Each ramus contains the following bony landmarks:

**Head** – situated posteriorly, and articulates with the [temporal](#) bone to form the [temporomandibular](#) joint.

**Neck** – supports the head of the ramus, and site of attachment of the lateral pterygoid muscle.

**Coronoid process** – site of attachment of the temporalis muscle.

The internal surface of the ramus is also marked by the **mandibular foramen**, which acts as a passageway for neurovascular structures. It serves as a conduit for the inferior alveolar nerve and inferior alveolar artery. They travel through the mandibular foramen, into the mandibular canal, and exit at the mental foramen.

The **mental foramen** is positioned on the external surface of the mandibular body. It allows the inferior alveolar nerve and artery to exit the mandibular canal. When the inferior alveolar nerve passes through

the mental foramen, it becomes the mental nerve (innervates the skin of the lower lip and the front of the chin).

